

1 1. A method comprising:
2 securing an integrated circuit having
3 microchannels formed therein to an integrated circuit to be
4 cooled;
5 enabling a cooling fluid to be pumped through
6 said microchannels by electroosmotic pumps; and
7 coupling said cooling fluid to an external heat
8 exchanger through tubes.

1 2. The method of claim 1 including packaging said
2 cooling integrated circuit and said heat generating
3 integrated circuit.

1 3. The method of claim 2 including extending tubes
2 from said package to said external heat exchanger such that
3 said heat exchanger is spaced from said package.

1 4. The method of claim 1 including forming a stack
2 of said cooling integrated circuit and said heat generating
3 integrated circuit.

1 5. The method of claim 4 including sealing the edges
2 of said stack except for ports to access said
3 microchannels.

1 6. The method of claim 5 including providing a fluid
2 inlet reservoir and a fluid outlet reservoir in
3 communication with said microchannels.

1 7. The method of claim 6 including forming said
2 reservoirs in a package including said stack.

1 8. The method of claim 7 including isolating said
2 inlet and outlet reservoirs in said package.

1 9. The method of claim 8 including coupling said
2 inlet and outlet reservoirs exteriorly of said package.

1 10. A packaged integrated circuit comprising:
2 a stack including an integrated circuit chip to
3 be cooled and a cooling integrated circuit chip, said
4 cooling integrated circuit chip including microchannels for
5 the circulation of a cooling fluid;
6 a package receiving said stack, said package
7 having formed therein an inlet fluid reservoir and an
8 outlet fluid reservoir to communicate with said
9 microchannels; and
10 an external heat exchanger mounted on said
11 package by a pair of cooling fluid circulating tubes.

1 11. The structure of claim 10 including a first
2 trench for containing a fluid so as to communicate from the
3 exterior of said cooling integrated circuit chip with said
4 channels.

1 12. The structure of claim 11 including a second
2 trench isolated from said first trench and abutting said
3 cooling integrated circuit chip in said package.

1 13. The structure of claim 12 wherein said second
2 trench to contain fluid and to fluidically communicate with
3 said microchannels.

1 14. The structure of claim 10 wherein the edges of
2 said heat generating integrated circuit chips are sealed.

1 15. A packaged integrated circuit structure
2 comprising:
3 a stack including an integrated circuit chip to
4 be cooled and a cooling integrated circuit chip, said
5 cooling integrated circuit chip including microchannels for
6 the circulation of a cooling fluid;
7 a package receiving said stack, said package
8 having formed therein an inlet fluid reservoir and an
9 outlet fluid reservoir to communicate with said
10 microchannels; and

11 an external heat exchanger in communication with
12 said outlet fluid reservoir and said inlet fluid reservoir.

1 16. The structure of claim 15 wherein the edges of
2 said integrated circuit chips are sealed.

1 17. The structure of claim 15 wherein said stack is
2 in contact with said fluid reservoirs.

1 18. The structure of claim 17 wherein said
2 microchannels communicate with the edges of said cooling
3 integrated circuit chip.

1 19. The structure of claim 15 wherein said external
2 heat exchanger is mounted on said package through a pair of
3 fluid circulating tubes, said tubes arranged to circulate
4 fluid through said heat exchanger.

1 20. The structure of claim 19 wherein said external
2 heat exchanger is spaced from said package.

1 21. The structure of claim 15 including
2 electroosmotic pumps in said cooling integrated circuit
3 chip.

1 22. The structure of claim 21 including a re-combiner
2 coupled to each of said electroosmotic pumps.